THE DELAWARE AND HUDSON RAILROAD BULLETIN

"the D&H"

SEPTEMBER 1, 1936

AUTUMN WOODS

Blessing on the Woods

BLEST be our woods of hemlock, maple, pine,
Balsam and birch, dear Lord, our woods and Thine!
Blest be their bubbling springs, their rippled lakes,
Their ponds, and every laughing brook that makes
Rainbows and foam and crystal homes for trout;
Blest be the trails that wander in and out
Among gray bowlders drowned in soft green seas
Of velvet moss! Oh, blest be all of these!

Blest be the woods and they that dwell therein:
The scolding squirrel and his gentler kin,
The friendly chipmunk and the timid hare;
Blest be the graceful mink, the shambling bear,
The beaver on his dam, the drumming grouse,
The hawk that loves the sky, the white-foot mouse,
The antlered buck that paces, proud and tall,
With doe and dappled fawn, blest be they all!

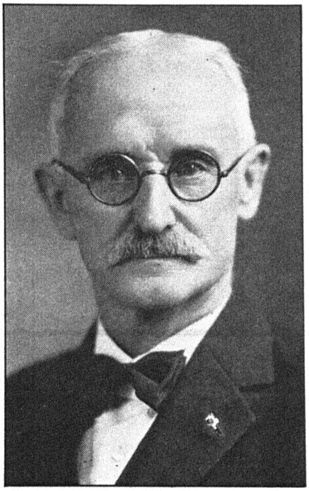
Lord, bless the woods for perfect loveliness,
For balm that heals the soul in care and stress!
Keep them forever fragrant, cool and sweet!
From thunderbolt and flame, from gale and sleet,
From avalanche, from torrent, drought and blight,
From all that is unclean, from ruthless might
That gives to desolation valley, glen
And mountainside, God bless our woods! Amen.

Arthur Guiterman in N. Y. HERALD TRIBUNE.

The
DELAWARE AND HUDSON RAILROAD
CORPORATION
BULLETIN

Ran Underground Plane

Retired Parsons Engineer Began 58-year Service on Mine Road



FRANK S. CLARK

THE fact that the Delaware and Hudson's first railroad, which crossed the mountains between the anthracite mines in the Lackawanna Valley and the canal at Honesdale, Pa., was for the most part gravity operated, is more or less common knowledge. That an underground gravity railroad system was in use by the company in its mines at the same time is not so generally known.

FRANK S. CLARK, veteran of 58 years' service with the Company, "ran" an underground gravity plane in the mines at Laurel Run (Wilkes-Barre) Colliery, back in the seventies. The gravity system was used to replace the loaded cars in mining chambers above the main tunnel with empties to be filled. When three cars had been loaded in the chamber a steel rope was run from the last car of the string, around a sheave equipped with a brake drum and lever, to three empty cars at the bottom of the underground plane. By removing the sprag which blocked the front wheel of the loaded string, the loads were started down the plane, their weight pulling up the three empties. By the hand brake lever the movement of the two "trains" could be controlled until the empties were "spotted" and stopped at the top of the plane, the loaded cars being hauled out of the mine by mule-power.

MR. CLARK, who was born at Waymart, Pa., a station on the Carbondale-Honesdale Gravity Railroad, June 14, 1862, entered the Delaware and Hudson Canal Company's employ, in the Coal Department at Laurel Run Colliery, at the age of 11, as a "breaker boy" or "slate picker." Less than a year later he was given the task of "oiling the breaker"—lubricating the big rollers which crushed the "run of mine" coal, the cogs, cable- and belt-wheels which connected the rest of the machinery with the steam engine which drove it. "Breaker boys" have long since disappeared from these collieries, now operated by The Hudson Coal Company. The task they once performed—removing slate from the coal—is now more efficiently done by mechanical devices.

In the thirteen years he spent in the Coal Department he served, in addition, as ventilating door tender down in the mines; as the driver of the mules which hauled the empty and loaded mine cars in and out of the workings; and finally as "runner" on the slope leading from the mines to the surface. On the last mentioned job, it was his duty to ride empty cars as they were lowered by cable from the outside stationary engine house to the various "levels" and "drifts" underground and to attach the cable to loaded cars to be hoisted up the slope to the surface. Communication between the "runner" and the stationary engineer was maintained by bell-cord signals, a device long since replaced by electrically-operated signals.

In 1886 MR. CLARK asked Yard Master Milot Shiffer, at Mill Creek, now Hudson, for a position as brakeman, and he was transferred to the Transportation Department just after the new steam locomotive railroad between that point and Wilkes-Barre was placed in operation.

That fall he became a locomotive fireman, working on the various mine runs which then originated at Hudson. Two of the engines then assigned to that service were the *James P. Dickson* and the *J. J. Albright*, Nos. 23 and 27, which were kept in the four-stall roundhouse, situated on the approximate site of the present car shops. About 1900, these locomotives were sent to Wilkes-Barre, the old Hudson roundhouse was abandoned and eventually torn down.

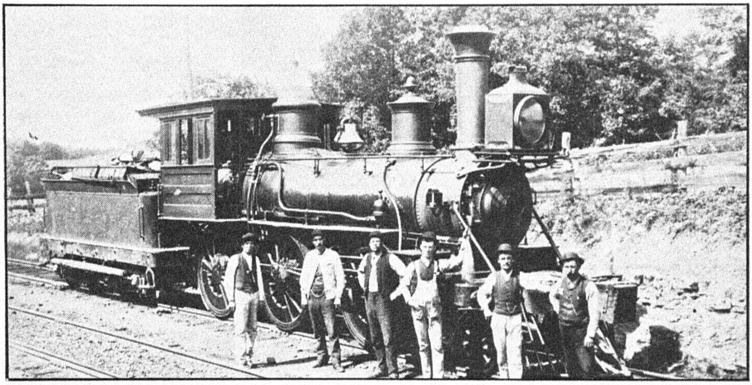
In 1895 MR. CLARK saw his first service as an extra engineer and in 1901 he was given a steady job on a mine run out of Wilkes-Barre. For a time, too, he was in passenger service, pulling the train which left Wilkes-Barre at 5:25 A. M. with passengers, mail, and express for Carbondale, and arriving at Wilkes-Barre on the return trip at 9:35 A. M. In later years he was frequently called upon to handle passenger trains between Wilkes-Barre, Scranton, Carbondale, and Nineveh, although he much preferred daylight mine- or Hudson-Yatesville pusher runs, which permitted him to spend every night at home.

For the past 35 years MR. and Mrs. CLARK, who have been married 54 years, have lived in their present home at 116 South Main Street, Parsons, now a part of Wilkes-Barre. They have six children: JOHN, a Delaware and Hudson trainman; Albert, an employe of The Hudson Coal Company; Mrs. Arthur Hand, of Scranton; Mrs. T. H. Leisenring, of Allentown, Pa.; and Mrs. William P. Reese and Mrs. D. H. Lippincott, both of Wilkes-Barre. In addition they have fourteen grandchildren and two great-grandchildren. MR. CLARK is a member of The Delaware and Hudson Veterans' Association, the Brotherhood of Locomotive Engineers, and the Masons.

Two In One

A celebrity was asked to recommend a hair lotion. He sent this reply: "Gentlemen—before using your hair lotion I had two bald spots; now I have one."

When Railroading Was "Middle-Aged"



Railroad Centennials being common in recent years, this picture, taken at Mill Creek (now Hudson, Pa.) in 1886, can hardly be classed as "old," though certainly not modern. Left to right: Dennis Arnold, Robert Carter, Mike Dougherty, David Edwards, Frank Clark and Seth Colvin.

Custom-Made Steels

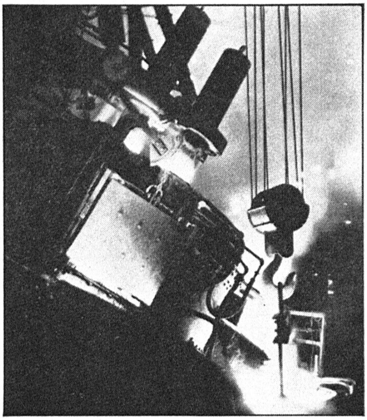
Ludlum Steel Company Produces Important Alloys Electrically

ONE of the finest examples of how the scientific curiosity of yesterday becomes the backbone of today's business is found among the products of Ludlum Steel Company, whose main plant adjoins the Delaware and Hudson property just west of Colonie Shops. Last year nearly two-thirds of the Company's output consisted of alloy steels either totally unknown or at best regarded as laboratory curiosities in 1919. "Stainless" steel is now familiar to everyone, its uses ranging from a ten-cent paring knife to the material from which 90 per cent of all automobile and airplane engine valves are manufactured. Ludlum pioneered in the field of stainless alloys and its Silcrome valve steel is recognized as standard by the great majority of motor manufacturers.

Locomotive designers, struggling to increase the efficiency of their machines, sought to utilize higher steam temperatures but found themselves balked by the inability of available metals to retain their strength when heated beyond a certain critical point. Yet in Ludlum's laboratories test specimens are heated to 1700 or 1800 degrees before being tested for hardness and tensile strength! Salt sprays try in vain to corrode the polished surface of stainless alloys.

It is immediately apparent that Ludlum is no ordinary steel mill, though its beginnings in New Jersey were along orthodox lines, steel springs for railroad cars having been a major product of wide reputation among the carriers of the 19th century.

Both pioneers in their individual fields, Ludlum and Delaware and Hudson have a mutual bond throughout the 82 years of the former's history. The abandonment of the Delaware and Hudson Canal, by means of which the Ludlum Company obtained its coal, together with the breaking of Ludlum's dam and its resultant destruction, led the company to transfer its business to the new plant in Watervliet in 1907. Here, in 1910, Ludlum began the manufacture of alloy steels by the all-electric-furnace method, designing and building its own furnaces. By 1919 it had established a reputation for its pioneer efforts in the field of "stainless" steels and had begun to develop what is now a series of such alloys grouped under the trade name of "Silcrome." Special tool and die steels are also found in the long list of the Company's products as well as alloy shock-resisting steels. Another, "Nitralloy," can be treated to make it harder than any other known steel.



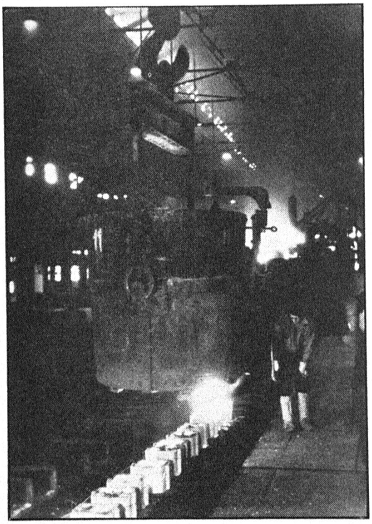
From Furnace to Ladle

Ludlum products might be said to be conceived in darkness since the melting of the steel, the first step in the manufacturing process, is done at night. As all the machinery used throughout the plant in the daytime operates by electricity, this arrangement helps to even up the load on the powerhouse. Selected steel scrap, together with proper amounts of various substances required to produce the desired chemical composition, is placed in a great "bathtub-on-wheels," some three feet deep, five wide and ten long, lined with fire brick and clay to withstand the tremendous heat to which it is subjected. This is moved under the cover portion of the furnace from which are lowered three huge electrodes that supply the heat necessary to raise the mass to a temperature of 3,000 degrees, pipes and jackets of flowing water being used to prevent overheating of the working parts of the furnace meanwhile.

The molten steel is then transferred by means of a ten-ton ladle to waiting molds, prepared the day previous, to form ingots weighing about 1,000 pounds each. The top of the ingot, which contains the slag and impurities, is cut off and scrapped, the rest going to an oil furnace for reheating before it goes under the steamhammer or through the rolls of the mill. Here it is reduced in section but increased in length so that it must be sheared off into cordwood lengths, termed billets, for convenience in handling.

As soon as the ingot cools sufficiently, samples are rushed to the laboratory for analysis and testing to determine the exact treatment the steel will require in the mill to give it the desired physical properties. On some orders, such as for airplane steel, it is necessary to wait for the purchaser's approval of tests at various stages of the process, thus keeping a large amount of steel tied up. With ordinary soft steel this might be a minor item since it is worth only about two cents per pound. The alloy steels are, however, several times more costly.

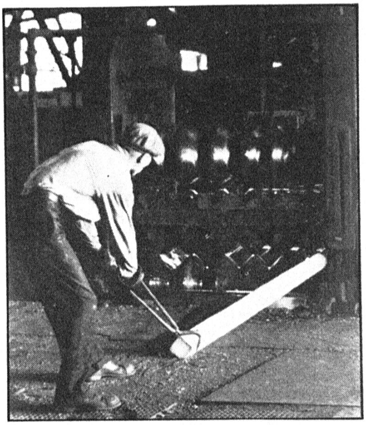
A good surface is the first requisite for most Ludlum products. Thus the billets go at once to the grinding room where the outer surface is ground off to permit close inspection for surface defects before further working. Inspections follow practically every step of the process from the casting of the ingot to the careful boxing of the finished steel for shipment.


Pouring Ingots

The billets which pass the watchful eye of the inspector are again heated for more rolling through the great mills until they reach the desired shape and size. They put the micrometer right on the red-hot bars as they leave the rolls, and make allowance for shrinkage in cooling.

Cooling is a matter they are very careful about. All passageways between buildings are carefully covered to prevent cold blasts of air striking the hot steel as it passes from point to point in the plant and altering its properties. Huge fans, however, provide a welcome circulation of air for the men who guide the glowing bars through the mill rolls.

Photos courtesy Ludlum Steel Co.


Through the Mill

Shining like silver, the stainless bars emerge from the centerless grinders in another department. These are the material which will be used for automobile valves, for your next car, perhaps.

Much of the steel shipped by Ludlum from Watervliet is sent to other plants of the Company for rolling into "strips" or for further processing, or to concerns that manufacture tools, such as twist drills, cutters, punches, gears, etc., also cutlery, cooking and serving dishes, automobile hub caps, and architectural trim, though the Silcrome valve steel is probably the most widely known of the company's products, although its high-speed tool steels are most widely used.

Power Plant on Wheels*

By A. I. LIPETZ

Chief Consulting Engineer, American Locomotive Company

Picture a "mobile power plant" of 4,000 horsepower, weighing 200 tons or more and moving at speeds in excess of 100 miles an hour, yet having an actual physical contact with the rails of less than 10 square inches, or about the size of a man's foot. There you have the modern Steam Locomotive, the power of which has been increased 55 per cent within the last 10 years without any increase in weight. Mr. Lipetz's comparison of the locomotive with some of the world's most efficient and modern stationary power plants and his description of various experimental types which have been developed should be of interest to *Bulletin* readers.

A VEHICLE containing a power plant and wheels which can be made to rotate while rolling on rails and thus propel the vehicle itself and cars attached to it, in short, a self-propelled power plant on wheels, is called a locomotive. This is going to be the subject of our discussion today. The given definition includes the steam locomotive, both of the reciprocating engine and turbine type, and the Diesel locomotive, of the Diesel-electric or any other type, but excludes the electric locomotive, because the latter does not carry the power plant. Therefore, by some authors, mainly German, the electric locomotive is not considered to be a locomotive at all; it is called by them the "electromotive."

The Steam Locomotive—Its Peculiarities

It is not necessary to refer to elaborate statistical data in order to prove that the bulk of our traffic on railroads is taken care of by steam locomotives. Of course, the main reason for that is that as the existing steam locomotives have been built to last a long time, say 15 to 25 years, and they are now with us, it is natural for them still to be doing useful work. Fifty thousand steam locomotives can not be put on idle tracks, or scrapped, even if a better machine were developed. Nevertheless, we should not overlook the fact that when new railroad motive power is ordered, small as it sometimes may be, depending on general business conditions, more steam locomotives are being built than locomotives of any other kind. During the six years of depression, 1930-1935, 1149 locomotives were built in this country, of which 979 locomotives were for use in the United States. This number is divided among various kinds of power in the following way:

Steam	623—	63.7%
Electric	252—	25.8%
Diesel-electric	104—	10.5%
Total	979—	100.0%

The number of electric locomotives includes the 150 locomotives of the outstanding electrification scheme of the Pennsylvania Railroad, which may have been somewhat prompted by the spirit of the public works projects of late years. It is interesting to note that as soon as business showed the slightest signs of improvement, steam locomotives again began to play a large part in the allotted orders. During the first two months of 1936 alone, the American locomotive builders received orders for 42 steam locomotives. No electric locomotives were ordered, and an order for 1 Diesel-electric was placed. Steam locomotive builders are now more busy than they were at any time since 1931, and new locomotive types are being evolved.

Longevity

There are several remarkable things about the steam locomotive. One is its longevity: it is over one hundred years old, and is still going strong. Very few machines can boast such a long span of life. The Watt steam engine has been superseded by the steam turbine, and the modern steam boiler bears little resemblance to the primitive boiler of a hundred years ago. But the modern locomotive embodies the same principles that spelled success for the Stephenson "Rocket" at the Rainhill trials of 1829. It is true that the locomotive has gone through a long period of evolution and has acquired a great many improvements and refinements, but substantially it still has the rectangular double-walled fire-box and the fire-tube boiler of the Seguin-Booth design, simple expansion cylinders, mostly two per one rigid frame (one cylinder on each side, as the case was in the "Rocket") ; an induced draft appliance for the draft in the boiler, operated by the exhaust steam from the cylinders developed by Trevithick and employed by Stephenson; a direct connection between the cylinder pistons and the wheels journaled in the engine frame, and smooth tires on wheels for direct adhesion to rails by friction, following the principle demonstrated by Hedley in 1814.

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*A paper presented before the Metropolitan Power Plants Committee, New York, Mar., 1936.

Simplicity

The second remarkable feature of the present day locomotive—its simplicity and adherence to its original design, which, I dare say, came out of Stephenson's hands in a classical and perfect form, something like a Beethoven symphony. Hundreds of attempts were made during the century of existence of the steam locomotive with the intent to improve upon Stephenson's design (some of them in recent times), but most of the improvements did not survive a trial even in a single model, and copies were never built; only a few of the novelties could stand the test of time, usually a very short time, after which they were, as a rule, abandoned. Their ephemeral success was sometimes due to local, political, national and other irrelevant causes, but so far, in 106 years, the locomotive invariably has reverted to its simple Stephensonian shape. Simplicity is the greatest attribute of a real man—and so it is of a locomotive, which has another feature in common with man: while a youth, it grew in size, power and weight, but retained its original appearance. The only essential change made in the physiology of the locomotive was the addition of the superheater, universally accepted as an attribute of maturity.

In order to comprehend the genius of George Stephenson, it suffices to say that his illustrious predecessor, James Watt, could not see a steam engine without a low pressure boiler and a condenser, and as he did not visualize a steam carriage thus equipped, he did not believe in the possibilities of steam traction on rails. He militated very strongly against the high pressure of 50 lbs. per sq. in., which he considered dangerous; that pressure was later used in the Stephenson locomotives. In one of his earliest years (1784) Watt took out a patent for a locomotive with a very complicated drive, which consisted of a sun and planet wheel transmission and two sets of gears, different in their proportions. He provided the two gears in order to adapt the power of the locomotive to the variable resistance of the road. Thus, even Watt did not have a clear picture of the power resulting from the expansive properties of steam, of which Stephenson was fully cognizant, as evidenced by the locomotives with direct drive which he built even prior to the "Rocket."

Economy

The third remarkable thing about the steam locomotive is the economy of its operation in spite of the alleged low overall efficiency. People familiar with thermo—dynamics and efficiencies of prime movers and heat engines, especially promoters of wild schemes, are usually harping on the low efficiency of the steam locomotive. True enough, the efficiency, thermo—-dynamically speaking, i. e., measured by the ratio of the Bru of useful work at the drawbar of the tender to the Btu in the fuel burned in the fire box, is very low. In a switching locomotive with large stand-by losses, it may be as low as 3% to 4%; in a road locomotive the overall efficiency is 6% to 7%; under favorable conditions, for instance, on a test bed, it may go up to 8%, and with some exceptionally good designs even to 8-½%. However, much as the efficiency figure is important, it tells us only part of the story. The whole story must include the economic aspect of the utilization of the locomotive as a whole. In the economics of locomotive operation the fuel cost is only one item of several equally important. The other items are: cost of maintenance, lubrication, locomotive handling in roundhouses, crew wages, etc., which are self-explanatory. But most important for the operation of the locomotive are: (1) reliability, and (2) availability.

Reliability means that a locomotive should not get unduly out of order while pulling trains. A failure of a locomotive on the road, causing delay to trains and a disorganization of traffic, costs a railroad much more than ordinary economy in the operation of dozens of locomotives can amount to. Therefore, if an economical turbine or Diesel locomotive should have many complicated accessories and auxiliaries which are likely to get out of order, causing failure on the road, it will not be acceptable to the railroad.

Availability means that a locomotive should be available as much as possible when it is required to do useful work. It is measured by the percentage ratio of the average number of hours when the locomotive is able to perform work, to the number of hours of offered work. Availability is

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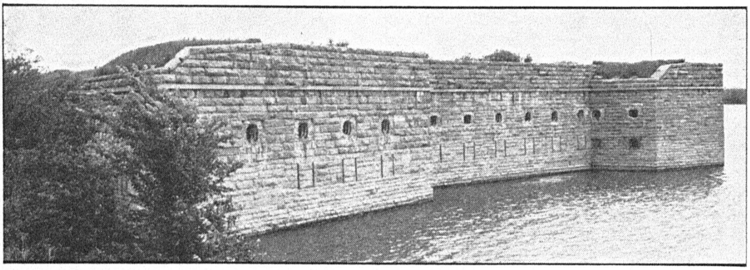
Wreckers' Destruction of

"Fort Blunder"

Climaxes Century of Mistakes



Fort Montgomery, built by U. S. on Canadian Soil

BY the time the snow flies again "Fort Blunder," so called because it was built on Canadian soil and a kink had to be put in the Canadian- American boundary line to include it in our borders, will be erased from the west shore of Lake Champlain, just north of Rouses Point, N. Y., yet its amazing story will continue to haunt the pages of American history for all time.

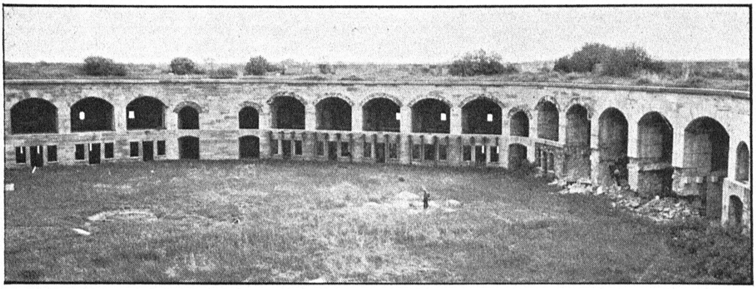
Although officially named Fort Montgomery, there is ample additional reason why historians, government officials, and laymen alike should call it Fort Blunder; its entire history is marked with blunders and contradictions. It cost over $600,000 compared with an estimate of $200,000, and, was finally sold, together with 400 acres of government land, for a paltry $45,000. It was over 50 years in the building yet when completed it was never garrisoned, no shot was ever fired at it or from it. The nearest to shell fire in its 120 years of existence were the blasts of dynamite used to tear it down that its carefully cut stones might be utilized in the construction of the new 6,000-foot bridge linking Rouses Point and Alburg, Vt.

The original plans, drawn soon after the war of 1812 by one of America's outstanding army engineers, Col. Joseph Totten, called for an octagonal fort, enclosing about three-quarters of an acre of land, the walls to be 30 feet high, with 10 bastions, and 3,000,000 bricks were to be used. The contractors, McMartin, McIntire, and Stewart, were to receive $200,000.

The long series of blunders which were to characterize its entire life, began as soon as the walls rose above the lake. Lacking modern pile driving machinery, a makeshift base of debris from the old Plattsburg battleground — slabs, boards, timbers, rails, logs, and stumps—was used, resulting in frequent settlements with consequent cracks in the masonry.

The construction proceeded through three summers—it was too bitterly cold to continue in winter—when, in October 1818, someone made the startling discovery that the fort was being erected nearly a mile north of the international boundary. All work was immediately suspended and for 24 years it stood just as it had been abandoned, except for the effects of the weather and the removal of odds and ends by the residents of the neighborhood.

Finally, in 1842, Daniel Webster, then Secretary of State, negotiated a treaty with Canada moving the boundary far enough north to make the fort and 100 yards of land beyond American property. The very fact that Canada was willing to be a party to such an agreement should have been ample proof of the worthlessness of completing the fort, for had there been any probability of an invasion by her or through her territory, she certainly would not have thus aided in the defense of our country. While there may have been reason for its construction in 1816, when the War of 1812 was still fresh in colonial minds and any



Its 60-foot Walls enclosed a 3½-acre Tract

attack from the north would probably have been made via the Richelieu River and Lake Champlain, as had been the case with Montcalm in the French and Indian War, Burgoyne in the Revolution, and Sir Guy Carleton in the War of 1812, this seems less reasonable in 1842.

Another crushing blow fell on the project almost immediately after the boundary was changed when the heirs of the Scotch contractors sued the government on their contract and were awarded a judgment in full, with interest for the long span of years since they had begun work.

Nevertheless, the U. S. Army resumed the construction work in 1843, under revised plans drawn by Captain Brewerton of the Engineering Corps. Two years later Lieutenant Mason and his men had to suspend operations long enough to hustle off to the Mexican border to fight Santa Anna, who had been stirring up trouble along the Rio Grande. When Mason returned he was replaced by Captain Meigs, under whom the plans were again revised and enlarged. Several others followed at intervals, each incorporating original ideas in the plans and construction work, until it was finally finished, about 1870, under a Captain White. When completed it covered 3½ acres, had 60-foot walls, and provision for 164 guns, although it was never armed.

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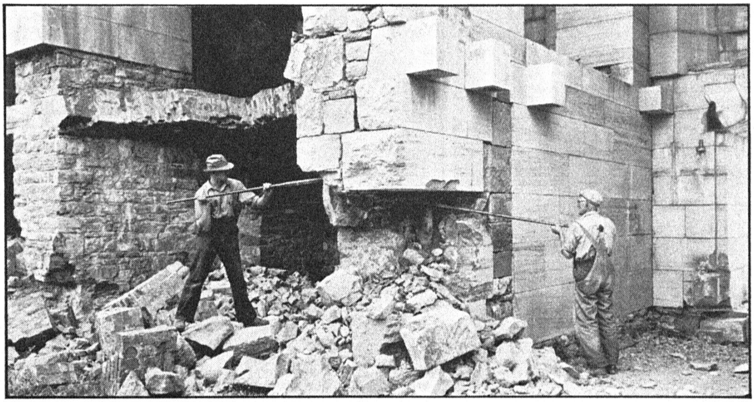

Dynamite reduces the Masonry to Crushed Stone in Final Act

Power Plant on Wheels

(Continued from page 136)

closely related to simplicity regarding maintenance. If a complicated, although perhaps a very ingenious and economical, machine needs frequent attention, fueling, cleaning, etc., replacement of parts that requires much time, and so on, the availability is low. The turbine locomotives, especially those with condensers, have a very low availability and, therefore, are not practical although they are twice as economical as reciprocating steam locomotives. Road Diesel locomotives have not shown great availability thus far and, therefore, they are still in the experimental stage. But on the other hand, switching Diesel locomotives have an availability close to 100 per cent and, therefore, in this kind of work, namely, in switching service, the Diesel locomotive has established itself as a useful motive power unit.

Closely related to simplicity regarding maintenance is simplicity of operation. This implies that the locomotive should not have too many handles, valves, gauges and other parts that require the driver's attention and tax his skill beyond what an ordinary engine driver is expected to do. Being intensely occupied with watching the signals, listening attentively to any suspicious sound in the behavior of the locomotive in the midst of the noise and clatter of a rolling and roaring engine, the crew has no physical possibility of attending to extra duties except the most elementary and customary ones. If there is an additional unusual handle or valve, the driver is unable to attend to it, no matter how important it should be for the proper operation of the locomotive. If it is important, it should be made automatic, provided the automatic action can be made reliable in the foregoing meaning of the word.

Compactness

The fourth remarkable peculiarity of the steam locomotive is the compactness of design, as exemplified by the power per any unit of reference: per cubic feet of occupied space, per pound of weight of the installation, per square foot of area of support, per dollar of investment, etc. Accurate comparable figures are not always available. Recently in "Power" I happened to come across a tabulation of new steam plants placed in operation in this country in 1935. It contains 11 utility, 9 municipal, 77 industrial plants, and 10 plants in institutions—a total of 107 steam plants. Only 4 plants have a boiler pressure of over 1000 lbs. per sq. in.; 44 plants have boilers carrying pressures between 300 to 1000 lbs., 15 plants between 200 and 300 lbs. per sq. in., and 34 plants, or about one third of the total, below 200 lbs., a pressure which in modern locomotive practice has already been discontinued. The tabulation is very incomplete, but there are several figures taken at random for boilers with pressures between 250 and 300 lbs., per sq. in., which is the pressure usually carried in newly built locomotives.

In the first case the evaporation per sq. ft. of heating surface is 8.8 lbs. per hour; in the second case it is 10.4 lbs. per sq. ft. per hour. In locomotives, evaporation per sq. ft. of heating surface varies from 12.6 to 14.2 lbs. per hour, or about 35% to 45% more. Per cubic foot of furnace it is respectively 22.0 and 25.8 lbs. Per one cu. ft. of locomotive fire box volume the figures of evaporation vary from 70 to 120 lbs. per hour, or about 220% to 360% more.

Slightly more complete figures can be found on the Hell Gate steam plant, which carries 265 lbs. per sq. in. and which consists of two units. Each of the two units has a capacity of 1,000,000 lbs. per hour and a heating surface of 53,926 sq. ft.; this corresponds to an evaporation of 18.6 lbs. per sq. ft. per hour. This seems to be higher than the usual locomotive evaporation. But these units have economizers and air preheaters, with 18,400 sq. ft. of economizer heating surface and 60,476 sq. ft. of air preheating surface to each unit,making a total of 132,802 sq. ft. heat absorbing surface (without superheater.) If referred to this figure, the evaporation will be only 7.5 lbs. per sq. ft. per hour. For a locomotive, if the heating surface of the feed water heater, which takes place of the economizer, is added (air preheaters are not used on locomotives), the evaporation figure would be 12.5 to 14.1 lbs. per hour.

The furnace volume of each unit of the Hell Gate boiler is 42,255 cu. ft., corresponding to an evaporation of 23.6 lbs. of steam per cu. ft. per hour, as compared with 70 to 120 cu. ft. of fire box volume in a locomotive.

The cubical contents of one unit of the Hell Gate boiler is 211,003 cu. ft., giving an evaporation of 4.74 lbs. of steam per hour per one cu. ft. of installation. In a locomotive the evaporation if referred to the volume of the whole boiler, is about 22 lbs. or 4.7 times as much.

Other figures also indicate the compactness of the locomotive boiler design. For instance, the number of Btu per cubic foot of fire box volume varies in a locomotive, with and without a stoker, from 150,000 to 200,000, while in the medium pressure stationary plants above referred to, the corresponding values are 27,500 to 33,500 or 16 to 18% of the locomotive figure. In the Hell Gate station, it is 32,430 Btu.

(Continued on page 141)

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The best and most important part of every man's education is that which he gives himself.

—GIBBON.

Solving a Problem

COMMENTING on the reported increase in passenger traffic on the railroads, the *Schenectady Union-Star* calls attention that this may be due to some extent to the number of expositions open this year, in Cleveland, Texas, Arkansas, and California, reduced rates for which helped to increase the number of passengers. The closing paragraph, which we quote below, is certainly food for thought.

"Another factor which is driving more and more people off the road is the increasing number and size of freight trucks which make motoring more dangerous and detract a great deal from its enjoyableness. Some day, motor manufacturers will have to go into a huddle among themselves to decide whether they prefer to sell quantities of automobiles and promote touring and the general use of cars which have been the great backlog of the business, or build freight trucks of greater and greater size."

Are we American citizens going to let this happen? It does look rather like it! We are enduring the effects of an economic depression one of the principal causes of which, in our estimation, is the inability of this or any other country to pay for an excess of transportation facilities, especially expensive highways which are being ruined by the pounding of monster, overloaded trucks.

Let us follow the lead of Kansas, whose Port of Entry system puts upon the commercial user of the highway the obligation to pay for such use in proportion to distance traveled and gross weight, in other words, in proportion to the damage done. Such a system will relieve motor manufacturers of the necessity for making any momentous decisions as it will render heavy trucking of rough freight unprofitable and put it back where it belongs—on the rails. Thus at one stroke highway safety may be increased, highway maintenance reduced, and the motor manufacturers relieved of what must surely be a most perplexing problem.

Binding *The Bulletin*

SEVERAL inquiries have been received from readers of *The Bulletin* who wish to bind each volume at the end of the year so that it will be handy for reference. Unfortunately no stock size binder will fit, but a local stationer advises that he can supply imitation leather spring binders suitable for holding 12 issues of *The Bulletin,* together with the Index for the year, for $1.00 each, provided they are ordered in lots of 50 or more.

All readers who are interested in obtaining such binders are requested to send their names and addresses to the Supervisor of Publication, Delaware and Hudson Railroad Corporation, Albany, N. Y., so that we may have an idea of how large the demand for such binders may be. DO NOT SEND ANY MONEY AT THIS TIME.

Gregorian Calendar

SEVERAL readers have called attention to the ambiguity of the article entitled "Reforming the Calendar" which appeared in the April issue of *The Bulletin.* Although the Gregorian Calendar was not adopted by Great Britain and her colonies in America until 1752, it was originally put in effect by Pope Gregory XIII in October 1582, the 5th of the month becoming the 15th in order to make up for time lost under the Julian Calendar.

Try It

IN the tombs discovered under the pyramids of Giza, in Egypt, a number is displayed conspicuously, chiseled deep in the numerals of an ancient people. These numerals, interpreted into figures of this day, read:

2520

That mystic number—2520—is divisible by any number from one to nine, and, according to mathematicians, you can't perform that miracle with another number.

Power Plant on Wheels

(Continued from page 139)

Boiler and Fire Box—Essential Parts of the Locomotive

All the figures so far cited refer to full load conditions, both of locomotives and stationary plants. The locomotive, however, is very often called upon to work overload, sometimes as high as 40%. True, the boiler efficiency may be then not over 50% but at lower loads, efficiencies, including feed water heaters, 85% to 90% have been recorded.

In the development of the locomotive it has been recognized for the last 20 years that the fire box, as the source of power of a locomotive, should be given ample dimensions. After some fluctuations the grate area, measured in square feet, has stabilized at about one-fiftieth of the horsepower: a 3500-h. p. locomotive would have a 70 sq. ft. grate area; a 5000 h. p., an area of 100 sq. ft. At the same time, the whole boiler has acquired larger dimensions, and for the last ten years large boiler capacity is the general rule for modern locomotives. As a result, the locomotive boiler has become more economical and better suited to the new conditions of traffic, when higher speeds not only for passenger, but also for freight trains, are demanded.

It is very difficult to state what the average boiler efficiency in a locomotive is, as this depends upon the variation in load which is different on various roads and for different trains. But as a fair guess, it can be said that the average boiler efficiency of a modern locomotive is about 65 to 78%, closer to the lower limit for locomotives without, and to the upper limit for locomotives with feed water heaters.

A modern stationary plant may have a higher boiler efficiency, but this is achieved by the use of large size economizers and air preheaters, which simply can not be installed in a locomotive so as to be of much value—this on account of space limitations. Several attempts of this kind have been made and were abandoned.

The superheater is now an inalienable part of the boiler. Although it was first introduced for stationary plants since 1905, it has enjoyed its greatest development in locomotives. The design is always, at least in this country, of the Elesco (Schmidt) type and the temperature is about 700-750 degs. F. Having a reciprocating engine, the locomotive engineer can not boast of temperatures of 800-950 degs. F., as some power plants have, but at least his engines always have superheaters. For a long time no new locomotives, even of the switching type, have been built without superheaters, although in stationary practice I have noticed in the above referred to tabulation of 1935, a great many new installations of the saturated type.

Engine Part of the Locomotive

The reciprocating engine of the locomotive, meaning the cylinders, pistons, driving mechanism, is the second essential part of the locomotive, the first being the boiler with the superheater. Again, after some fluctuations the engine has reverted to the two-cylinder, simple expansion type of the first locomotives, varying design in accordance with the rise in pressure, which continuously was going up, and with the introduction of superheat, first with multicylinder compounding, and later without it. The thermal efficiency of the steam engine part of a locomotive at 250 to 300 lbs. pressure and 750 degs. F. total temperature, without a condenser, is now about 12 per cent, referring to the rim of the driving wheels. Among latest developments, the refinements in the design of steam passages and the improvement in valve motions have been of great value. The essential improvement, however, which would turn the non-condensing into a condensing engine, has so far not met with any degrees of success, as we shall see later in greater detail.

Running Gear of the Locomotive

The third essential part of the steam locomotive is the running gear—wheels, frame, springs and trucks. Changes made in the design pertain mainly to trucks and articulations of locomotives which improved their riding qualities, especially at high speeds. Great improvements have been made in the materials of parts of the running gear, which were made to stand the great weights and high stresses in our present day locomotives at speeds up to 100 miles per hour. Strange to say, even in this respect the most modern high-quality alloyed steels met with limited success and only in some special cases.

I think of great interest to the plant engineer would be to learn which of the improvements made in his stationary plant were tried on the locomotive and the reasons for which they failed. We might proceed in the order which we followed, taking up first the improvements in the boiler, and then in the engine.

Various Attempts to Improve the Efficiency of the Steam Locomotive Water Tube Fire Boxes

The water tube fire box was probably the first part of the locomotive, except the superheater, influenced by stationary plant practice. During the nineteenth century the boiler pressure rose from 50 lbs. per sq. in. in Stephenson locomotives to 200 to 225 lbs per sq. inch in American and European locomotives. It was thought at that time that these pressures were about the limit for a radial-stay fire box, and that for higher pressures water-tube fire boxes would be necessary. Partly in anticipation of this eventuality, and partly because the maintenance of staybolt fire boxes at high pressures had become very costly, water tube fire boxes began to appear. In the U. S. A. about a score of locomotives was built for the New York, New Haven and Hartford with McClellon water-tube fire boxes during the period 1916-1925. This boiler was a combination of a water-tube fire box and a cylindrical shell of the conventional locomotive boiler. They were similar to the Brotan fire boxes built in Europe (Hungary, Austria, Germany, Russia) in the early part of this century. None of these experiments was successful, as instead of staybolt troubles of the conventional fire box, eliminated in the Brotan and McClellon fire boxes, other difficulties, such as cracking of sheets in the cylindrical part of the boiler, arose. All these locomotives, except several on the Hungarian railways, were converted into ordinary engines with staybolt fire boxes, although pressures in these boilers were not very high—not over 265 lbs. per sq. in.

To the same category of innovations belongs the Emerson boiler put on some engines of the Baltimore and Ohio Railroad. It differs from the Brotan boiler in that better provisions for cleaning scale from the tubes are made. Some of these boilers have been in service for about nine years and they seem to be giving very good results. The highest pressure that they carry now is 350 lbs. per sq. in.

(To be continued)

Determination

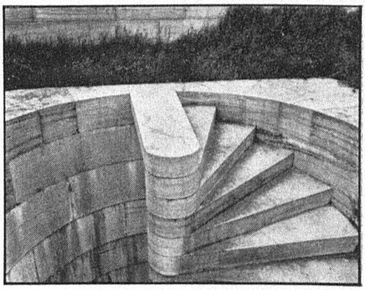
THE spirit that wins was recently manifested by a small boy who was learning to skate with a number of older playmates. The frequent mishaps of the little fellow awakened the pity of a tender-hearted woman.

"Why, Sonny, you are getting all bumped up," she said. "I wouldn't stay on the ice and keep falling down; just come up here and watch the others skate."

The tears of the last downfall were still rolling down his glowing cheeks, but he looked from his adviser to the shining steel of his feet, and answered: "I didn't get some new skates to give up with; I got 'em to learn how with!"—*Rays of Sunshine.*

"Fort Blunder"

(Continued from page 138)



Self-supporting Spiral Staircase

As the decades rolled by its uselessness became increasingly apparent until it was sold at public auction, together with 140 acres of land, for $45,000, September 17, 1926. At various times individuals and corporations toyed with the possibility of converting it into a military museum or a lakeshore resort during the vacation season, yet none of these schemes ever bore fruit.

Finally, this year, the contractor building the Lake Champlain bridge bought the fort to use some of the limestone blocks to riprap the approaches and foundations, while others will be crushed for use in the concrete work.

Yet anyone who has seen the structure, with its massive outside walls, its white-arched hallways, its once invulnerable chambers, its bastions with their semi-circular iron tracks on which guns were to have swung menacingly to point out the enemy, will be led to wonder if, of all the mistakes made in the amazing history of Fort Montgomery, to tear it down was not the greatest blunder of them all.

A Socialist Defined

The children were discussing things they would do when they grew up.

"Yes," said little Peggy, "when I grow up I'll have a big motorcar."

"So shall I," put in her brother Eric.

"And a big yacht," Peggy went on.

"So shall I," chanted Eric.

Peggy paused for new ideas.

"Oh, then I'll have a big party every night," she continued.

"Yes, and so shall I," Eric agreed.

"Eric," expostulated Peggy suddenly, "you must be one of those people Daddy calls 'so-shall-ists.' "

Clicks from the Rails

A Medal of Honor

has been awarded to Atlantic Coast Line conductor Carl N. Mathis, of Wilmington, N. C., by President Roosevelt, for saving the life of a boy. While riding across the tracks at a grade crossing, in front of cars being switched, the boy became confused and fell from his bicycle directly in front of the train. Mathis pulled the boy to safety with his right hand but his left hand was pinched between the bicycle and the rail when the car wheel ran over the bicycle. In wrenching his hand free the conductor suffered a painful laceration and his shoulder was struck by the car. His was the forty-third medal presented under the Congressional Medals of Honor Act passed in 1905.

✣

Horned Toads,

792 of them, recently made the rail trip from Abilene to Dallas, Tex., to appear at the Texas Centennial Exposition. While these creatures are not new to Texans—one horned toad, "Old Rip," was found alive after 30 years' confinement in a sealed cornerstone of the old court house building at nearby Eastland—expressmen were amazed to watch them laying eggs. One produced four eggs in ten minutes, bringing up the question of whether they should be billed as "frogs"—as Texans call them—or as "a box of frogs and a case of eggs."

✣

Double-Deck Coaches

are a feature of a new steam-hauled, streamlined train operated by the Lubek-Buchen Railway (Germany). The car floor is only a few inches above the rails, providing sufficient height for two "decks" with a total seating capacity of 300 in two articulated coaches. The doors are at the standard platform level, inside stairways leading to the upper and lower floors. Windows are provided on both floors.

Canada's Railroads

were 100 years old July 21, 1936, having grown from the 14½-mile long Champlain & St. Lawrence Railway, between Laprairie and St. Johns, Que., to a total mileage of 42,000 in that time. The event was celebrated with the unveiling of monuments at the terminals of the original line as well as St. Lambert, to which the line was extended in 1852. Visitors from Montreal were conveyed to these communities on a special 18-car train, pulled by the Canadian National's new streamlined locomotive No. 6400, said to be the world's largest, one of the cars carrying the engine *Dorchester* which pulled the first train over the road 100 years before. Canadian railroads now own 5,000 locomotives, 7,000 coaches, 200,000 freight cars, and employ 120,000 people who receive $164,000,000 in wages annually.

✣

Air-Conditioned Pullmans

are having an unexpected effect on the hotel business. Traveling men with 3 to 6 hour train rides ahead of them formerly tried to catch a late afternoon train, figuring on a full night's sleep in a hotel bed. Now many have reversed the process, considering most Pullman cars cooler and more comfortable than many hotel rooms. This trend has been noted on such runs as those from Chicago to St. Louis, Detroit, or Indianapolis and from New York to Washington, Boston, or Albany.

✣

Track Handcars

are as extinct as the dodo on some American railroads. During a railroad week celebration at Walla Walla, Wash., a scheduled handcar race had to be canceled because officials couldn't find a handcar. The agent of one transcontinental line told them that his road hadn't used one in ten years.

"Grandma" Bailey, Aged 104

of Albany, N. Y., who died August 5, was the last living person who had ridden on the first passenger train in the world which, pulled by the engine *De Witt Clinton*, ran from Albany to Schenectady in 1831. Born at Thompson, Conn., January 27, 1832, Mrs. Bailey's family "went west" to Seneca Falls, N. Y., in 1836, traveling from Albany to Schenectady on this famous train. She liked to tell how her little brother, clad in a new suit, was leaning out of the window of one of the cars when a trainman grabbed him by the seat of his trousers and pulled him back on the seat, thinking he was about to fall out.

✣

A Giant Steel Tank,

42 feet in diameter, with a capacity of 175,000 gallons, recently made a 1¼-mile trip across Laurel, Miss., on a Gulf, Mobile & Northern flat car. The huge container, which was wider than the single-track right of way in places, was held in position by a crane while being moved by a locomotive. The big tank was moved to one edge of the car at one point to clear a house, and several telephone poles were removed. The problem of getting it across the final obstacle, a mill pond, was solved by "launching" and floating the tank across—it drew 14 inches of water.

✣

Rambler Roses

line many miles of New Haven tracks in four states, all taken from an initial planting in a deep cut at Mount Vernon, N. Y., in 1909, which cost $5,000. Since that time annual cuttings and transplantings have been made so that there are now 57,000 bushes along the line. The 41-mile stretch between New York and South Norwalk is practically solidly planted. In addition to beautifying the right of way, their roots materially retard soil erosion in the cuts.

Time

TIME is, thou hast;
See that thou well enjoy;
Time past, is gone;
Thou canst not that employ;
Time future, is not,
And may never be;
Time present, is the
Only time for thee.

ARABIAN PROVERB.